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VIII.—*On the Anatomy of Diplommatina, and its Affinity with Cyclophorus and Pupina in the Cyclophoridae.* By JOHN DENIS MACDONALD, M.D., F.R.S., Staff-Surgeon, R.N.

[Plate IV.]

THE animal of the little Himalayan shell first named *Bulimus folliculus* in Dr. Pfeiffer's Monograph of the Helicidæ was discovered by Capt. Hutton and Mr. Benson to differ from that family in the situation of the eyes, these "not being borne on the summits of the tentacula." Capt. Hutton, in his MS., had actually named it *Carychium costatum*; but Mr. Benson, considering it to differ also from *Carychium* sufficiently to form the type of a new genus, named it *Diplommatina*. He chose this name from having observed that the eyes "were composed of two lobes—one lobe deeply seated in the tentaculum and larger than the other lobe, which is a small black point coming to the surface on the outer side of the larger lobe." "Had the animal been provided with an operculum," he further remarks, "it might possibly have been referred to the family of Cyclostomatidæ." It is clear, therefore, that Mr. Benson, while admitting the affinity of his *Diplommatina folliculus* to *Carychium*, considered it to be merely the type of a new genus at least referable to the same group, and not to the so-called Pulmonifera operculata. But the fallacy of reasoning upon insufficient data is well illustrated in the controversy which followed between Mr. Benson and Dr. Gray as to the character "operculo nullo" (*Ann. & Mag. Nat. Hist.* 1853, vols. xi. & xii.). There can be little doubt, also, but the belief on the part of the founder of the genus, that the eyes were situated on the posterior part of the tentacula near their base, gave colour to the possible absence of an operculum; and such would be more conformable with the section to which

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it was too hastily assumed to belong. Dr. Gray, however, as it then appeared, settled the question satisfactorily by the examination of original specimens in which an operculum was undoubtedly present. At the time the number of the 'Annals' containing his letter came into my hands, I was employed in the South Seas*, and, being well acquainted with three distinct species of *Diplommatina* occurring at Lord-Howe Island, I thought I might readily furnish Dr. Gray with drawings of the shell, operculum, and animal of those species, should his argument require further support. Nevertheless, on visiting the island of Vatoa, Feejee group, I was not a little surprised to find a very minute and smooth pupiform shell, with dextral turns, thickened double peristome, and a tooth on the columellar lip, containing an animal in every particular identical with that of *Diplommatina* save the operculum, of which I did not discover a trace, though the cicatrix of the operculigerous lobe was distinct enough, as shown in the figures (1 & 2 *d*, Pl. IV). The above-mentioned question immediately recurred to my mind, and I also reflected how far are shell-characters to be trusted in the establishment of genera, and how wide is the latitude within which specific distinctions may range. I sympathized with Mr. Benson; for, according to my own experience, not only in this case but in numerous other Feejeean species, if the operculum be present at all, it must be in a very rudimentary state.

Conchologists might prepare a new genus for the reception of the little shell just noticed, which exhibits but few points in common with the known *Diplommatinæ*; yet even this would not shake my faith in a conclusion the truth of which is most evident to my own mind, namely, that the occupant is *Diplommatina*, name the dwelling what you please. In substantiation of this view, I may mention that of eight or nine new Feejeean species of the genus, all of which are sinistral, some have simple peristomes, others tooth-like processes in the aperture, and the latter is constricted, expanded, or more or less ascendent, as the case may be; but the animals are in all instances similar, or only exhibit specific differences. Although the generic characters of *Diplommatina* are now more comprehensive than they originally were, there appears to be a too great readiness on the part of pure conchologists to found new genera upon any shells that are not conformable in every minute particular with the primary description, which in the nature of things cannot be supposed to be infallible.

In the mountain-country of Na Viti Levu I found at least

* In H.M.S. 'Herald,' Captain, now Admiral, Sir H. M. Denham, K.C.B.

eight species of *Diplommatina*, and arranged them in my notebook as follows:—

- I. Aperture in the plane of the axis of the shell.
 - 1. Peristome perfectly circular. Two species.
 - 2. Parietal lip meeting the palatal and columellar lips at an angle. Three species.
- II. Aperture lateral.
 - 1. Peristome impinging on the penultimate whorl, edentate. One species.
 - 2. Peristome impinging on the terminal whorl; a tooth on the columellar lip.
 - a. Shell full, large, sinistral. One species.
 - b. Shell narrow, minute, dextral. One species.

At Norfolk Island I found a minute *Diplommatina* (Pl. IV. figs. 3 & 4) that would fall into the second division of the foregoing table, the aperture being lateral. The peristome is double, perfectly circular, and everted, the last two characters as well as its minute size being characteristic. The operculum (fig. 5) is quite circular, like the aperture, and regularly spiral, with a curved ridge for muscular attachment towards its anterior border.

In all the *Diplommatinæ* examined by me the eyes were uniformly situated at the outer side of the base of the tentacula, and even a little encroaching upon the head. I have always recognized, also, that their labial and lingual dental organs, like those of their near allies the *Pupinæ*, were strictly conformable to the Cyclophoroid and not to the Cyclostomatous type, which two natural families are still further distinguished by the *invariable presence of otoconia in the earsacs of the former, and single spherical otolithes in those of the latter.*

I am borne out in my statement as to the position of the eyes of *Diplommatina* by the remarks of Mr. W. T. Blandford accompanying an outline sketch of the animal of an Himalayan species by Capt. Godwin-Austen, published in the Ann. & Mag. of Nat. Hist. 1867, vol. xix. p. 306. He says, "I have more than once, within the last few years, called attention to the circumstance that, in the two supplements to Dr. Pfeiffer's admirable monograph of the living operculated land-shells, the position assigned to the genus *Diplommatina*, close to *Acicula*, and in a suborder distinguished by the position of the eyes above the base of the tentacles, is not in accordance with the structure of the animal;" and, referring to the figure, he further adds, "The eyes, as will be seen, are distinctly lateral, as in *Cyclophorus.*" My own drawing (fig. 1), which was carefully taken from nature, confirms this view; and lest some

misunderstanding should arise as to the apparent situation of the eyes in fig. 2, it should be stated that the object was viewed by transmitted light—a circumstance that might account for the original mistake, had the animal been so observed. In regard to the supposed relationship of *Diplommatina* to *Acicula*, I can only say, not having been able to examine any of the typical *Aciculæ*, that, if they are indeed allies of *Truncatella*, they have nothing to do with *Diplommatina*.

The next important contribution to the anatomy of *Diplommatina* is to be found in a short paper by Mr. R. J. L. Guppy "On the Occurrence of *Diplommatina Huttoni* in Trinidad" (Ann. & Mag. Nat. Hist. 1867, vol. xx. p. 96), the more pertinent part of which runs thus:—"The lingual dentition, being very minute, is somewhat difficult of preparation; but I have been able to make out its characters, which are as follows:—The dental band is of moderate length; the teeth are 3.1.3, the median is broad, its edge narrowly reflexed and five-toothed, its base narrow, almost pointed. The first and second laterals are subclavate, their edges reflexed and three-toothed. The third lateral is somewhat hamate and obscurely tricuspid. The mandible is broad and flat, covered with very distinct, separate, lozenge-shaped plates. All this tends to induce one to retain this genus in the Cyclophoridae, to which these characters attach it more closely than to the Cyclostomidae." In these remarks we find a recognition of the distinctness of the two families named, and of what is unquestionably the true position of *Diplommatina*. The amber-tinted labial plates, composed of obliquely rhombic cells, first, I believe, noticed by myself in *Pupina* and *Diplommatina**, are quite characteristic of the Cyclophoridae; for although very similar organs are present in *Natica* and *Triton* and their allies amongst marine Proboscifera, the labial plates of *Cyclostoma*, *Hydrocena*, and *Assimineia* are very different. I have now only to remark that the dentition of *Pupina* is so identical with that of a species of *Cyclophorus* (fig. 10) occurring at the Isle of Pines, that I did not think it necessary to furnish a drawing of it. On the other hand, the dentition of *Diplommatina* makes a nearer approach to that of *Cyclophorus aquilum* figured by Mr. Woodward†, the central dental plates in particular being expanded in front to support a greater number of teeth. The recognition of the two types here indicated will be of importance in the distribution of other genera referable to the Cyclophoridae.

* In a paper read before the Royal Society, Feb. 26, 1857, "On the Natural Affinities and Classification of Gasteropoda."

† Manual of Mollusca, p. 175.

EXPLANATION OF PLATE IV.

- Fig. 1.* An enlarged figure of a minute, smooth, pupiform shell, with an animal like that of *Diplommatina* protruding, obtained at the Island of Vatoa, Feejee; specimen young, not having yet attained the thickened double peristome noticed in the text.
- Fig. 2.* The animal removed from the shell, and exhibiting the following parts:—*a*, the labial or buccal plates, composed of thin indurated cells resting upon more or less regular courses of square ones; *b*, lingual cartilages and fore part of the tongue, with the lingual sac extending backwards from it; *c*, tapering tentacula, with the eye at the outer side of the base; *d*, the opercular scar distinctly visible (but the operculum was not found in this species); *e*, the auditory sac, containing otoconia; *f*, cesophagus; *g*, salivary glands; *h*, rectum.
- Figs. 3 & 4*, respectively, enlarged back and front views of a minute sinistral shell, with trumpet-like eversion of a perfectly circular, continuous, and double peristome; occurring at Norfolk Island.
- Fig. 5.* The operculum of the foregoing, highly magnified, as are also the following figures.
- Fig. 6.* Lingual cartilages, odontophore, and sac.
- Fig. 7.* Ear-sac, with otoconia.
- Fig. 8.* Buccal plates, the lingual teeth resembling the following.
- Fig. 9.* Two transverse rows of the lingual dentition of one of the *Diplommatinae* of Lord-Howe Island.
- Fig. 10.* Ditto of *Cyclophorus*. Isle of Pines.

There is in nature even a closer resemblance between the external lateral teeth of these two tongues than is exhibited in the figures.

Haslar Hospital, June 5, 1869.

IX.—*The last Discoveries in the extreme North.*

By OSWALD HEER*.

THE high northern latitudes contain a region larger than half Europe, and which, although less distant from us than most other parts of the world, is still entirely unknown to us. For a long time we have been trying to penetrate it. There, in fact, ought to be the shortest route from Europe to the East Indies and Western America. The search after this perfectly practical result, the discovery of a new maritime course, has, during the last three centuries, led to the greatest sacrifices; but, in spite of repeated efforts, the problem remains unsolved. To the present moment the 82nd parallel of north latitude marks the limits of an unexplored and always icy region, at the gates of which the bravest men have beaten in vain. We must even add that we have lost all hope of one day discovering a maritime route leading to the Indies across the polar seas.

* Translated by W. S. Dallas, F.L.S., from the 'Bibliothèque Universelle,' tome xxxix., April 1869, pp. 512-543.